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climes. Occasionally the young, strong, and healthy appear to flourish and even fatten for a time, but with the majority the reverse sooner or later happens; and probably when longer tried and better known, it will be found, as indeed it already has, unsuited and even dangerous for the prolonged residence of Europeans, and especially unfit for open-air work in the sultry sun; and further, that though the cool south-east monsoon is enjoyable enough for a warm climate and not specially insalubrious, the opposite humid and rainy season is more weakening and far less healthy. Even during the comparatively cool south-east monsoon, the heat and increased perspiration cannot prove otherwise than slowly debilitating; while in the wet season the cutaneous exudation, so copious as to keep the surface constantly bathed, is notably weakening and unhealthy. In proof of these opinions corroborative facts might be given, were they necessary or appropriate here.

XIV.—*On the Elevation of the Country between Bushire and Teheran.* By MAJOR O. ST. JOHN.

THE country traversed by the main road between the north of the Persian Gulf and the Caspian may be generally described as a succession of long valleys of inconsiderable breadth and various elevation, separated by parallel ridges running north-west to south-east.

On examination of the comparative height and extent of these ranges, they are found to group themselves into four systems or chains, of different physical aspect and geology, and with well defined watersheds.

After leaving the shores of the Persian Gulf at Bushire, a traveller skirts the hills in a northerly direction for 40 miles. He then crosses two inconsiderable ranges of tertiary formation, the summits of which are about 3000 feet above the sea, to the valley or plateau of Konartukte (1800 feet). The pass of Kotul Meloo, by which this last is reached is, though short, one of the most difficult in Persia, and many camels and mules are annually lost in the ascent of its formidable declivities. A somewhat similar, but less arduous pass, leads to the fertile valleys of Kammarej, Shapoor, and Kazerün, 2800 feet above the sea. The hills hitherto crossed are composed of sandstone of loose texture, marls, and gypsum. At Kazerün we enter the great series of saddle-shaped hills of nummulitic limestone, which is the great geological characteristic of this part of Persia.

Up to this point the scanty vegetation is confined to ragged

Vertical
Scale
(in feet)

10,000

9000

8000

7000

6000

5000

4000

3000

2000

1000

Bushire

Dabibi 250

Kotul-i-Meloo 1800

Kotul Kanmaraj 3000

Kazerun 2650

Kotul-i-Dokhter 4250

Desht-i-Ber 4200

Kotul Pa-i-zan

Kotul Dashtiarjun

Karaguleh River

Shiraz 4750

Zirgon 4500

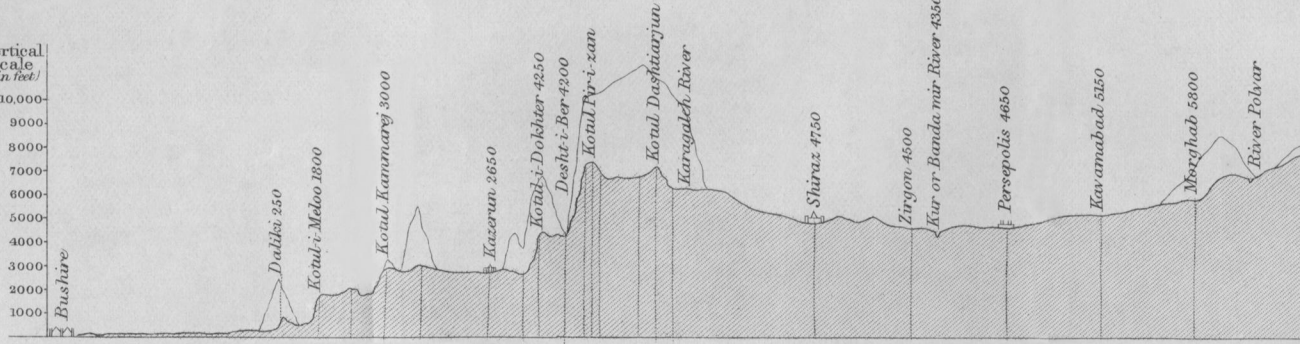
Kur or Banda mir River 4350

Persopolis 4650

Kavamabad 5150

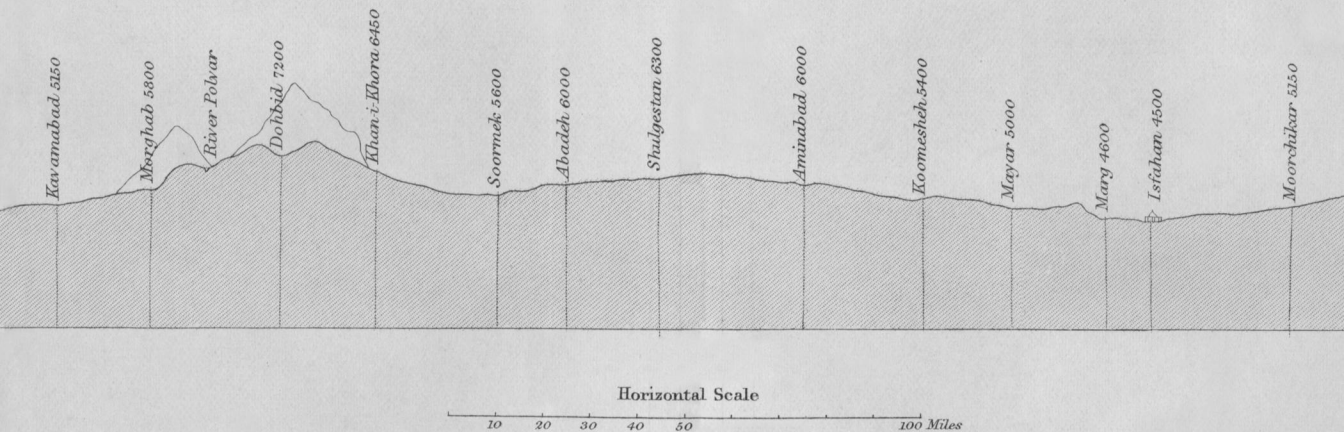
Morghab 5800

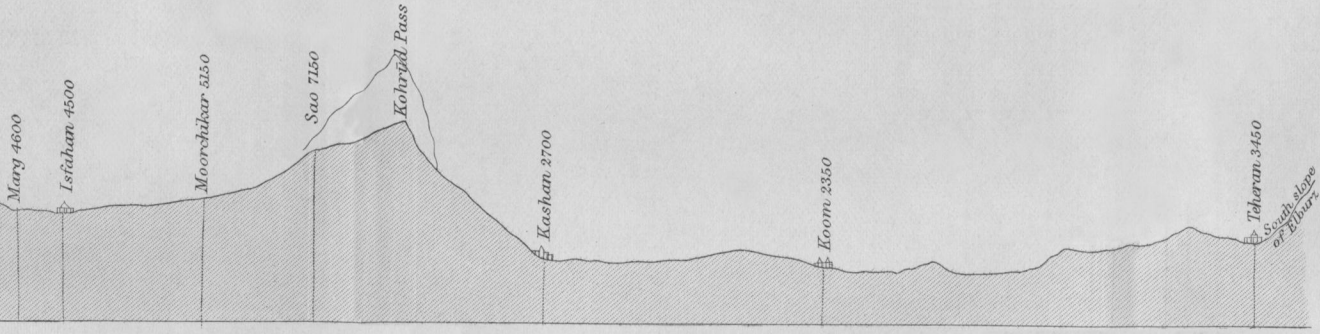
River Polvar



S E C T I O N from B U S H I R E T O T E H E R A N

to accompany the Paper by Major O. S^t John.





bushes of wild almond and *Rhamnus* scattered over the hill sides, with a few stunted terebinth trees towards the summit of the passes. From Kazerūn till the limestone formation is left, the hills are clad with forests of gall-nut oak, hawthorn, wild pear, terebinth, and many other shrubs, principally rosaceæ and amygdalaceæ. From the nummulitic limestone to the crest of the Elburz there is not, except in the beds of the rare streams, a bush six feet high unplanted by the hand of man.

Eight miles from Kazerūn the road abruptly ascends 1500 feet by the Kotul Dokhter Pass, and five miles further on rises 3000 feet higher to the summit of the pass of Kotul Pir-i-zan, 7250 feet above the sea. The summits on each side of this pass tower 2000 feet above it, and some parts of the range attain an elevation of 11,000 to 12,000 feet, and are clad with snow for six months of the year.

We are now on the watershed of the first range, which extends from the high summits north of Bebetran, in 31° north latitude to 28° of latitude, at least, if it is not continued still further to the south-east. Not a drop of water from its northern slopes, as far as I have seen or can ascertain, reaches the Persian Gulf. From its summit to that of the Elburz, the few streams that are not absorbed by irrigation form the salt lakes of Neyris and Makelm, or lose themselves in the sands of the great eastern desert.

From the crest of the Kotul Pir-i-zan we descend 750 feet to the valley of Dashtiarjun (6500 feet), and crossing a spur of the range whose watershed we have passed, emerge upon the table land of Persia, here 6000 feet above the sea, but descending 1250 feet in the thirty miles which intervene before we reach Shiraz (4750 feet).

For the next 100 miles, the northward road winds at the same level through several short parallel ranges of the same formation, separated by valleys varying in width from 2 to 15 miles.

Here the monotonous limestone ridges are exchanged for a chain of fantastic peaks, forming the summits of the second range. This chain, a prolongation of the great Bakhtiari range (which is probably the highest in general level in Persia, exceeding even the Elburz), is crowned by peaks from 9000 to 11,000 feet above the sea, and is crossed by passes 3000 feet lower. Some of its higher plateaux are well watered and fertile, forming the summer home of countless wandering tribes, others are utterly deserted. Descending the long gentle slopes of this range, we turn to the north-west, and without crossing any elevation of importance, but imperceptibly falling 2000 feet in the last 100 miles, we reach Isfahan, 4500 feet above the

sea. Fifty miles further to the north, gradually rising again as we proceed, we reach the great range of hills which extends from Hamadan to Yezd, forming the boundary of the great salt desert. Its height above the sea in the part where we cross it does not exceed 10,000 feet, the summit of the pass being 8200. The ascent on both sides is gradual, descending 5500 feet to the plain of Kashan (2700), 30 miles from the crest of the pass at an almost even slope.

We now travel in a north-west direction along the narrow strip of inhabited country lying between the mountains we have just left and the salt desert, at an elevation of 2000 to 3000 feet. Crossing three isolated ranges of inconsiderable height, we reach Teheran (3350 feet), lying at the foot of the Elburz, which towers to a height of 9000 feet above it.

XV.—*On the Confluence of the Rivers Mantaro and Apurimac, in the Huanta Mountains.* By Professor ANTONIO RAIMONDI, Honorary Corresponding Member, R.G.S.

Read, February 8th, 1869.

As it is of primary importance, for the future prospects of Peru, to facilitate the navigation of all those large rivers of the Trans-Andean region which are tributaries of the Amazon, and thereby open out a passage to the Atlantic by that mighty river, I resolved on an expedition into the heart of the Huanta mountains, in order to become acquainted with and examine the point of junction of the Apurimac and Mantaro: the former passing through a great portion of the department of Cuzco, and the latter by Jauja and Huancayo. Many were the obstacles to the accomplishment of such a journey, there being no roads, and the parts in question being inhabited by the savage Campos or Antes tribe, the same which, in 1852, put to death the Reverend Father Cimini. Nevertheless, confiding in my seventeen years' experience of continuous travels in the interior of Peru, and in the knowledge I had acquired by numerous negotiations with the wild races on the Rivers St. Anna, Ucayali, and Amazon, I did not for a moment hesitate in carrying out my project, and, fortunately, I surmounted every difficulty.

With the view of imparting a clear idea of the region under consideration, I shall first of all briefly describe the respective sources and extent of the Rivers Mantaro and Apurimac, their confluence forming the goal of my undertaking.

The Mantaro takes its rise in the extensive lagoon of Chinchaycocha, called also the Junin or Reyes Lagoon, by the